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(54) **SASH WINDOW UNIT, AT LEAST COMPRISING A FRAME WITH A SASH WINDOW WHICH IS SLIDABLE VERTICALLY THEREIN**

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FENETRE A GUILLOTINE COMPRENNANT AU MOINS UN CADRE A L'INTERIEUR DUQUEL COULISSE UNE FENETRE COULISSANTE

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Description

[0001] The present invention relates to a sash window unit, at least comprising a frame with a sash window which is slideable vertically therein by means of two guideways comprising a single track, which can interact with one or more guide parts, sealing means between the sash window and the frame, closing means for moving the sash window relative to the frame at substantially right angles to the plane of the sash window over a relatively small distance for at least near a closed position of the sash window, placing said sash window in sealing contact with the frame, with the interposition of the sealing means, and on release to make the sash window slideable without appreciable friction and means for holding the sash window balanced in an open position.

[0002] Such a sash window unit is known from EP-A-0 438 778. The sash window disclosed in said European application comprises means on the sash window for moving the guide parts relative to the sash window. Said means comprise a handle coupled with angle bars, on which the guide parts are mounted.

[0003] The presence of movable guide parts on the sash window itself has the disadvantage that with such a sash window unit always relatively large side members of the sash window are necessary to house the respective components. This is especially considered to be a drawback in case of large sash windows, which may sometimes have a large area of up to 7 m², as these windows will then become excessively heavy, giving rise to extremely large forces exerted on the guide parts and coupled components with consequent increased wear.

[0004] Sash window units have been in use for over a century already for many buildings, such as houses, factory workshops etc. The invention is, of course, not limited to such older sash windows, but can also be used in the case of sash window units yet to be fitted. Sash windows have the advantage that they do not involve swinging windows or the like, and are thus not affected by wind. Moreover, windows which swing outwards in houses directly beside the street or a pavement are forbidden, and windows swinging inwards require empty window sills. A relatively large area of a window can be opened in a simple way in the case of sash windows.

[0005] The means for holding the sash window balanced in an open position are often designed in the form of a counterweight which is connected by a cord to the sash window by means of a pulley, and which lies in a weight shaft in or near the frame.

[0006] Apart from the practical advantages, the appearance of sash windows also gives them an aesthetic advantage compared with other types of windows.

[0007] Sash window units are still being placed in new buildings, and there are also a large number of listed buildings with sash window units which have to be

restored, and in which the sash windows must be retained, but where sound and heat insulation are essential. Therefore there exists a need of improving known sash units.

5 [0008] The object of the present invention is to provide a solution to the abovementioned problems and to provide a generally improved sash window unit. To that end the sash window unit according to the invention is characterised in that the guide parts are stationary, and that the closing means comprise locally curved paths in the tracks, each guide part being designed to cooperate with a respective locally curved path, such that upon closing of the sash window, said sash window is placed in sealing contact with the frame automatically.

10 [0009] According to the invention, it is therefore made possible to use a sash window in said unit with relatively small dimensions of the side members and consequently having a relatively small weight. The sash window can be closed in an essentially airtight and soundproof fashion, without the sealing means being impeded in any way during the upward movement of the sash window in the frame, and so-called "skewing" or pulling out of square of the sash window in the frame, possibly resulting in it becoming jammed, is also prevented.

15 [0010] The basic principle lies in the fact that the locally curved path of the guideway is such that on a downward movement of the sash window, due to the curved path of the guideway, the sash window is forced against the frame, with the interposition of the sealing means.

20 [0011] Per se stationary guide parts and closing means forming part of the guideway are known from FR-A-2 339 045, however the sash window unit disclosed therein differs from the present unit in the following aspects. The movement of the sash window relative to the frame is relatively large and every guideway comprises more tracks. Further during opening of said sash window the movement of the window does not take place at substantially right angles to the plane of the window, but the window has to be tilted first.

25 [0012] The guide parts used in the sash window unit according to the invention can be any guide part known in the art ranging from guide wheels to solid guide blocks and even guide strips.

30 [0013] In a more preferred embodiment the guideway has a stepped cross-section, comprising two or more guiding levels, and that each level of the guideway comprises a locally curved path, and can interact with one or more corresponding guide parts, in which a guide part which can interact with a deeper guiding level has a smaller diameter and a greater length than an adjacent guide part which can interact with a shallower guiding level, and that the guide part with the smaller diameter can be moved past the locally curved path of the shallower guiding level for the adjacent guide part.

35 [0014] In this way the distance over which the window can be moved is greatly increased and depends on

the number of levels in the guideway. A further advantage of this embodiment is that with the same or even a larger maximum moving distance of the window the number of guide parts can be increased, such that during the movement of the window at substantially right angles to the sliding direction thereof the forces exerted on the guide parts are divided over more guide parts.

[0015] Preferably the closing means comprise the guideway or a part thereof, with the interposition of a suitable coupling, being movable by means of one or more operating parts. All moving parts are associated with the guideways and the guide parts are stationary.

[0016] In particular the coupling in the previous embodiments is designed in the form of a draw bar, which is provided locally with one or more projections which can interact with suitably shaped recesses in the part to be moved, and which can be moved by means of one or more operating handles. Apart from a draw bar, other transmission mechanisms are also conceivable here, such as a rack and pinion or chain mechanism.

[0017] The sash window can be brought into sealing contact with the frame at any desired height position by moving the guideway or a part thereof relative to the frame.

[0018] Advantageously the guideways comprise at least one switch which can pivot about a hinge point and can be operated by the coupling to be moved between three positions, a fixed open position, a position aligned with the guideways, and a closed position. This embodiment will be explained in detail in the description, of the drawing.

[0019] The invention will be explained in greater detail below with reference to the appended drawing, in which:

Fig. 1 shows a view in perspective of a common sash window unit in a partially opened position;
 Fig. 2 shows a view in perspective of a part of a frame of a sash window unit according to the invention, with a guideway with locally curved path;
 Figs. 3a and 3b show a view in perspective of a disassembled part of a sash window unit with a frame according to Fig. 2;
 Figs. 4a and 4b show a view in perspective of a dismantled part of the sash window unit according to Fig. 3, with a burglarproof lock;
 Fig. 5a shows in perspective a part of the frame of an improved embodiment of the sash window unit according to Fig. 2;
 Fig. 5b shows in perspective a part of the corresponding sash window for the frame of Fig. 5a;
 Fig. 5c shows a cross-section of the frame and sash window according to Figs. 5a and b in assembled condition;
 Fig. 6a shows a cross-section of a sash window and a frame, with a movable guideway on the frame;
 Fig. 6b shows a view in perspective of a part of the

frame according to Fig. 6a;

Fig. 7a shows a cross-section of a frame and a window, in which a part of the guideway is movable;
 Fig. 7b shows a view in perspective of a part of the frame according to Fig. 7a.

[0020] Fig. 1 shows a perspective view of a common sash window comprising a frame 1 containing a sash window 2. The frame generally also comprises a fixed top window 3, but there are also sash windows in which a space into which a sash window can slide is present above the frame. The sash window 2 in Fig. 1 is shown in a partially open position, so that the guideway 4 in the vertical members of the frame is visible. This guideway is a simple guideway comprising a groove in the frame, into which the sash window can be slid with an edge of complementary shape of the side member thereof.

[0021] Fig. 2 shows a view in perspective of a part of a vertical member of a frame 1 of an embodiment of a sash window unit according to the invention, in which the guideway is formed by a tubular section 5 with a groove 6 in which guide parts 7 situated on the sash window 2, which can be seen in Fig. 3b and Fig. 4b, can be guided. These guide parts are preferably sliding blocks or wheels, by means of which a very smooth, low-friction guiding is obtained.

[0022] A curved path is formed locally in the guideway 5, through the presence of a shoulder 8 and a recess 9 in the guideway 5. If the sash window 2 is moved in the downward direction in the guideway 5, when a wheel 7 passes the shoulder 8 the sash window 2 will be pressed against the frame 1, with the interposition of the seal 10, which is designed in the form of a rubber section. The transverse movement imposed by the curved path of the guideway 5 is such that, on opening the sash window, the window is just detached from the seal 10. Needless to say, a corresponding guideway 5 is present on both vertical members of the frame 1, the number of shoulders and recesses 9 corresponding to the number of guide wheels on the sash window.

[0023] Figs. 3a and 3b show in perspective, and disassembled, both a part of the frame of the embodiment according to Fig. 2 and of the sash window 2, with double glazing 11 therein.

[0024] In the figures we shall not go into any further detail on the means for holding the sash window balanced in an open position, since these are generally known and, as discussed earlier, can be made in the form of a counterweight in a weight shaft, which is connected to the sash window by means of a cord or a belt by way of a pulley.

[0025] Figs. 4a and 4b show in perspective, and disassembled, the frame and the sash window according to Fig. 3, with a burglar lock being present. The latter comprises a draw bar 12 which can be operated by means of a rotatable handle 13. In the closed position of the sash window one end of the draw bar 12 can be

moved into a recess 14 in the frame 1, in order to make it impossible to open the window from the outside.

[0026] Figs. 5a and 5b show in perspective a side member of the frame 1 and a sash window 2 which together form an improved embodiment of the unit as shown in Fig. 2. In this embodiment the guideway 5 comprises a stepped cross-section, defining two guiding levels 6a and 6b, which can interact with guide wheels 7a and 7b respectively. Further the guiding levels 6a, 6b each comprise at least one locally curved path formed by respectively shoulder 8a and recess 9a, and shoulder 8b and recess 9b. Each level usually comprises two or more of these curved paths.

[0027] The shoulders and recesses all define the same curved path, such that during closing of the window the respective guide wheels are all displaced over substantially the same distance. In Fig. 5a the respective curved paths of the two levels 6a, 6b are shown rather close together separated by a break line. They will be further apart in practice. The distance between the curved paths equals the distance between the corresponding guide wheels 7a, 7b.

[0028] Guide wheel 7a, comprising the smallest diameter and the largest length, is guided in guiding level 6a and guide wheel 7b, with a larger diameter and a smaller length, is guided in guiding level 6b. If the sash window is pushed upward guide wheel 7a can pass the curved path in guiding level 6b formed by shoulder 8b and recess 9b. When the window is moved downwards and the guide wheels 7a, 7b meet the respective shoulders 8a, 8b the window is forced against the frame 1 with the interposition of the seal 10, during which movement the guide wheels 7a, 7b are displaced over substantially the same distance.

[0029] Of course the number of guiding levels can be increased as required. The number of guide wheels will then also increase correspondingly. With this embodiment it is possible that when e.g. three guiding levels are used and three sets of corresponding guide wheels, with a distance between the guide wheels of 0,5 m, the window can be opened over a distance of 1,5 m.

[0030] In Fig. 5c a cross-section is shown of the frame 1 and sash window 2 of the previous figures 5a and 5b in an assembled condition.

[0031] Figs. 6a and 6b show in cross-section and in perspective respectively a side member of a frame 1 and a window 2 of a sash window unit according to the invention, in which the guideway 5 can be moved relative to the frame using a draw bar 15. The latter is situated in the frame 1 behind a cover plate 16, and a projection 17 thereof projects through the cover plate 16 into a suitably shaped recess 18 present in the guideway 5. The draw bar 15 can be operated with the aid of suitable operating parts, such as a crank or handle on the frame. When the draw bar 15 is moved upwards by the operating parts, the guideway 5 will be moved to the seal 10, owing to the shape of the recess 18, with the result that the window, whose guide wheels 7 are situ-

ated in the guideway 5, will be pressed against the seal 10.

[0032] Figs. 7a and 7b show an embodiment in which a vent opening of the window can be achieved through displacement of the draw bar 15, but in which it is ensured that the window cannot be opened any further from the outside. The guideway 15 comprises at least one switch 21 which can pivot about a hinge point 23 and also has a recess 22 which can interact with the projection 17 of the draw bar 15 situated in the frame 1. If the window is closed, with a guide wheel in the switch 21, when the draw bar is moved downwards the switch will turn to the position shown in Fig. 7b, and the window can be opened slightly. The stop 24 prevents the guide wheel 7 from running out of the switch in this position, due to the window being moved upwards. When the stop 24 is removed, the sash window 2 is simple to slide out of the frame 1.

[0033] If the draw bar 15 is moved the other way, the switch 21 is first of all moved to a position parallel to the guideway 5, at which moment the window can be slid to any desired height in the frame 1. When the switch is moved again, the window 2 is moved against seal 10.

[0034] It will be clear that, on the basis of the above description, many variants of the sash window according to the invention will be obvious to the average person skilled in the art.

[0035] Figs. 8a and 8b show an embodiment in which the guideway 5 contains a draw bar 25 which is provided with a stop 26, which can be moved along by a carrier 27 on the sash window 2 when the sash window is moving downwards. The draw bar 25 is suspended in a spring-loaded manner by means of a spring 28, so that when the window moves up again it returns automatically to its position. A thickened part 29 in the guideway 5, a recess 30 in the draw bar 25 interacting therewith, and a recess 31 in the guideway 5 are also present. If the sash window 2 is moved downwards, the draw bar 25 is moved downwards when the carrier 27 makes contact with the stop 26, and the interaction of the thickened part 29 with the recess 30 in draw bar 25 causes movement of said draw bar 25, which acts upon guide wheel 7 and thereby presses the window 2 against the seal 10. Usually more of these thickened parts with interacting recesses and adjacent recesses in the guideway 5 will be present to match the number of guide parts.

[0036] A particularly elegant embodiment of this is shown in cross-section in Fig. 9a, in which guide wheels 7 are fixed to a fixing plate 32 on the sash window 2, and in which the guideway 5 is connected to a spring fixing rod 34, with the interposition of a connecting pin 33. The pin 33 is situated in a guideway 35 in a weight shaft 36. An additional guideway is shown by 35', by means of which the weight shaft is both left-handed and right-handed and can be used on both sides of a frame. The spring fixing rod 34 in Fig. 9d contains spring fixing recesses 38 for fixing a spring 40, and also has an

opening 39 for fixing the pin 33. The spring 40 can be fixed at the other end in a top enclosure (not shown) of the weight shaft 36. This top enclosure generally also contains the pulley for guiding the cord or the strap for connecting the sash window 2 to the counterweight.

[0037] This embodiment of the sash window unit works as follows. The window 2 can be moved up and down in the guideway 5 without movement of the guideway 5 or the spring fixing rod 34, but when the sash window 2 is moved to the closed position, as soon as the lower guide wheel 7 touches the closed end 37 of the guideway 5 the guideway 5, and thus the spring fixing rod 34, will be carried along. The lower guide wheel 7 is advantageously adjustable in height, so that the unit can be adjusted. The pin 33 is then displaced in the guideway 35, with the result that a transverse movement is imposed on the sash window 2. The sash window 2 is thereby pressed against the seal 10, as shown in the preceding figure. The pin 33 can also be provided with a wheel which fits into the slot 35, in order to improve the guidance in this slot 35.

[0038] For the sake of clarity it is pointed out that the top side of the weight shaft 36 is shown in Fig. 9b and that recesses 35, 35', distributed at several points in the vertical direction, can be present. Fig. 9c shows the bottom side of the guideway 5, which extends over virtually the entire length of the weight shaft 36. Fig. 9d shows the top end of the spring fixing rod 34 with an opening 39. Over the length of this rod 34 there are as many openings 39 present as there are recesses 35, 35' in the weight shaft 36. The guideway 5 also contains a corresponding number of openings for fixing the pins 33.

[0039] Preferably in this embodiment a guide strip is used instead of guide wheels 7, extending over substantially the entire length of the sash window 2.

[0040] In Fig. 10 another embodiment of the unit according to Figs. 9a-d is shown. In this case the rod 34 is omitted and the spring 40 is secured to the guideway 5. Further the pin 33 and guideways 35, 35' are substituted by an arm 41 with two pivot pins 42 and 43. This embodiment works the same as the previous embodiment, the auxiliary guiding means being designed as a pivotable arm instead of a pin and guideway.

[0041] It will be clear that, on the basis of the above description, many variants of the sash window according to the invention will be obvious to the average person skilled in the art.

Claims

1. Sash window unit, at least comprising a frame (1) with a sash window (2) which is slidable vertically therein by means of two guideways (5) comprising a single track, which can interact with one or more guide parts (7), sealing means (10) between the sash window (2) and the frame (1), closing means for moving the sash window (2) relative to the frame

5 (1) at substantially right angles to the plane of the sash window (2) over a relatively small distance for at least near a closed position of the sash window (2), placing said sash window (2) in sealing contact with the frame (1), with the interposition of the sealing means (10), and on release to make the sash window (2) slidable without appreciable friction and means for holding the sash window (2) balanced in an open position,

10 **characterised in that the guide parts (7) are stationary, and that the closing means comprise locally curved paths (9) in the tracks, each guide part (7) being designed to cooperate with a respective locally curved path (9), such that upon closing of the sash window (2), said sash window (2) is placed in sealing contact with the frame automatically.**

2. Sash window unit according to claim 1, **characterised in that the guideways (5) have a stepped cross-section, comprising two or more guiding levels (6a, 6b), and that each level of the guideways (5) comprises a locally curved path (9a, 9b), and can interact with one or more corresponding guide parts (7a, 7b), in which a guide part (7a) which can interact with a deeper guiding level (6a) has a smaller diameter and a greater length than an adjacent guide part (7b) which can interact with a shallower guiding level (6b), and that the guide part (7a) with the smaller diameter can be moved past the locally curved path (9b) of the shallower guiding level (6b) for the adjacent guide part (7b).**

3. Sash window unit according to claim 2, **characterised in that the closing means comprise the guideways (5) or a part (21) thereof, with the interposition of a suitable coupling, being movable by means of one or more operating parts.**

4. Sash window unit according to claim 3, **characterised in that the coupling is designed in the form of a draw bar (15), which is provided locally with one or more projections (17) which can interact with suitably shaped recesses (18; 22) in the part (5; 21) to be moved, and which draw bar (15) can be moved by means of one or more operating handles.**

5. Sash window unit according to claim 3 or 4, **characterised in that the guideways (5) comprise at least one switch (21) which can pivot about a hinge point (23) and can be operated by the coupling to be moved between three positions, a fixed open position, a position aligned with the guideways (5), and a closed position.**

Patentansprüche

1. Schiebefensteranordnung, mindestens mit einem

Rahmen (1) mit einem darin in zwei jeweils eine Schiene aufweisenden, mit einem oder mehreren Führungselementen (7) zusammenwirkenden Führungen (5) vertikal verschiebbaren Schiebefenster (2), mit Dichtmitteln (10) zwischen dem Schiebefenster (2) und dem Rahmen (1), mit Schließmitteln zur bezüglich der Ebene des Schiebefensters (2) im wesentlichen rechtwinkligen Bewegung des Schlebefensters (2) um eine vergleichsweise geringe Strecke relativ zum Rahmen (1), um das Schiebefenster (2) zumindest in der Nähe der geschlossenen Stellung des Schiebefensters (2) unter Zwischenschaltung der Dichtmittel (10) in Dichtkontakt mit dem Rahmen (1) zu bringen und um beim Öffnen ein im wesentlichen reibungsfreies Gleiten des Schiebefensters (2) zu ermöglichen, und mit Mitteln zum Halten des Schiebefensters in einer schwelbenden Öffnungsstellung, **dadurch gekennzeichnet**, daß die Führungselemente (7) ortsfest angeordnet sind, und daß die Schließmittel örtlich gekrümmte Wege (9) in den Schienen aufweisen, wobei jedes Führungselement (7) mit einem entsprechenden örtlich gekrümmten Weg (9) zusammenwirkt, so daß beim Schließen des Schiebefensters (2) dieses automatisch in Dichtkontakt mit dem Rahmen gelangt.

2. Schiebefensteranordnung nach Anspruch 1, **dadurch gekennzeichnet**, daß die Führungen (5) einen stufenförmigen Querschnitt mit mindestens zwei Führungsebenen (6a, 6b) aufweisen, und daß jede Ebene der Führungen (5) einen örtlich gekrümmten Weg (9a, 9b) aufweist und mit mindestens einem entsprechenden Führungselement (7a, 7b) zusammenwirken kann, wobei ein Führungselement (7a), das mit einer tieferen Führungsebene (6a) zusammenwirken kann, einen kleineren Durchmesser und eine größere Länge aufweist als ein benachbartes Führungselement (7b), das mit einer flacheren Führungsebene (6b) zusammenwirken kann, und daß das Führungselement (7a) mit dem kleineren Durchmesser an dem örtlich gekrümmten Weg (9b) der flacheren Führungsebene (6b) des benachbarten Führungselements (7b) vorbei bewegt werden kann.

3. Schiebefensteranordnung nach Anspruch 2, **dadurch gekennzeichnet**, daß die Schließmittel die Führungen (5) oder ein Teil (21) davon umfassen, wobei ein geeigneter Kupplungsmechanismus zwischengeschaltet ist, der mittels mindestens eines Betätigungselements bewegbar ist.

4. Schiebefensteranordnung nach Anspruch 3, **dadurch gekennzeichnet**, daß der Kupplungsmechanismus als Zugstange (15) ausgebildet ist, die stellenweise mit einem oder mehreren Vorsprüngen (17) versehen ist, die mit entsprechend

5. Schiebefensteranordnung nach Anspruch 3 oder 4, **dadurch gekennzeichnet**, daß die Führungen (5) mindestens einen Schalter (21) aufweisen, der um einen Schwenkpunkt (23) schwenkbar ist und mittels des Kupplungsmechanismus zwischen drei Stellungen verstellbar ist, einer festen Öffnungsstellung, einer bezüglich der Führungen (5) ausgerichteten Stellung und einer Schließstellung.

15 **Revendications**

1. Fenêtre à guillotine, au moins comprenant un cadre (1) contenant une fenêtre coulissante (2) qui peut coulisser verticalement par l'intermédiaire de deux chemins de guidage (5) comprenant une piste unique, qui peuvent interagir avec une ou plusieurs parties de guidage (7), un dispositif d'étanchéité (10) situé entre la fenêtre coulissante (2) et le cadre (1), un moyen de fermeture pour déplacer la fenêtre coulissante (2) par rapport au cadre (1) à pratiquement angle droit avec le plan de la fenêtre coulissante (2) sur une distance relativement petite pour, au moins près d'une position fermée de la fenêtre coulissante (2), placer ladite fenêtre coulissante (2) en contact étanche avec le cadre (1), avec l'interposition du dispositif d'étanchéité (10), et, lors de la libération, pour que la fenêtre coulissante (2) glisse sans frottement notable, et un moyen pour maintenir la fenêtre coulissante (2) en équilibre en position ouverte, **caractérisée en ce que** les parties de guidage (7) sont fixes et que le moyen de fermeture comprenne des parties incurvées (9) dans les pistes, chaque partie de guidage (7) étant prévue pour coopérer avec une partie incurvée locale respective (9) de telle manière qu'en fermant la fenêtre coulissante (2), celle-ci soit automatiquement placée en contact étanche avec le cadre.
2. Fenêtre à guillotine suivant la revendication 1, **caractérisée en ce que** les chemins de guidage (5) aient une section comprenant deux ou plusieurs niveaux de guidage (6a, 6b) et que chaque niveau des chemins de guidage (5) comprenne une partie incurvée localement (9a, 9b) et puisse interagir avec une ou plusieurs parties de guidage correspondantes (7a, 7b), dans lequel une partie de guidage (7a) qui peut interagir avec un niveau de guidage plus profond (6a) a un plus petit diamètre et une plus grande longueur qu'une partie de guidage adjacente (7b) qui peut interagir avec un niveau de guidage moins profond (6b), et que la partie de guidage (7a) à plus petit diamètre peut être déplacée au-delà de la incurvée localement

(9b) du niveau de guidage plus profond (6b) pour la partie de guidage adjacente (7b).

3. Fenêtre à guillotine suivant la revendication 2, caractérisée en ce que le moyen de fermeture comprend les chemins de guidage (5) ou une partie (21) de ceux-ci, avec l'interposition d'un dispositif de couplage adéquat, qui est mobile au moyen d'une ou plusieurs parties de fonctionnement. 5

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4. Fenêtre à guillotine suivant la revendication 3, caractérisée en ce que le dispositif de couplage est prévu sous la forme d'une barre de tirage (15) qui est pourvue localement d'une ou de plusieurs projections (17) qui peuvent interagir avec des creux de forme convenable (18 ; 22) dans la partie (5 ; 21) à déplacer, et que la barre de tirage (15) peut être déplacée au moyen d'une ou de plusieurs poignées de fonctionnement. 15

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5. Fenêtre à guillotine suivant la revendication 3 ou 4, caractérisée en ce que les chemins de guidage (5) comprennent au moins un contact (21) qui peut pivoter autour d'un pivot (23) et peut être mis en fonctionnement, par le dispositif de couplage, pour être déplacé entre trois positions, une position ouverte fixe, une position alignée avec les chemins de guidage (5) et une position fermée. 25

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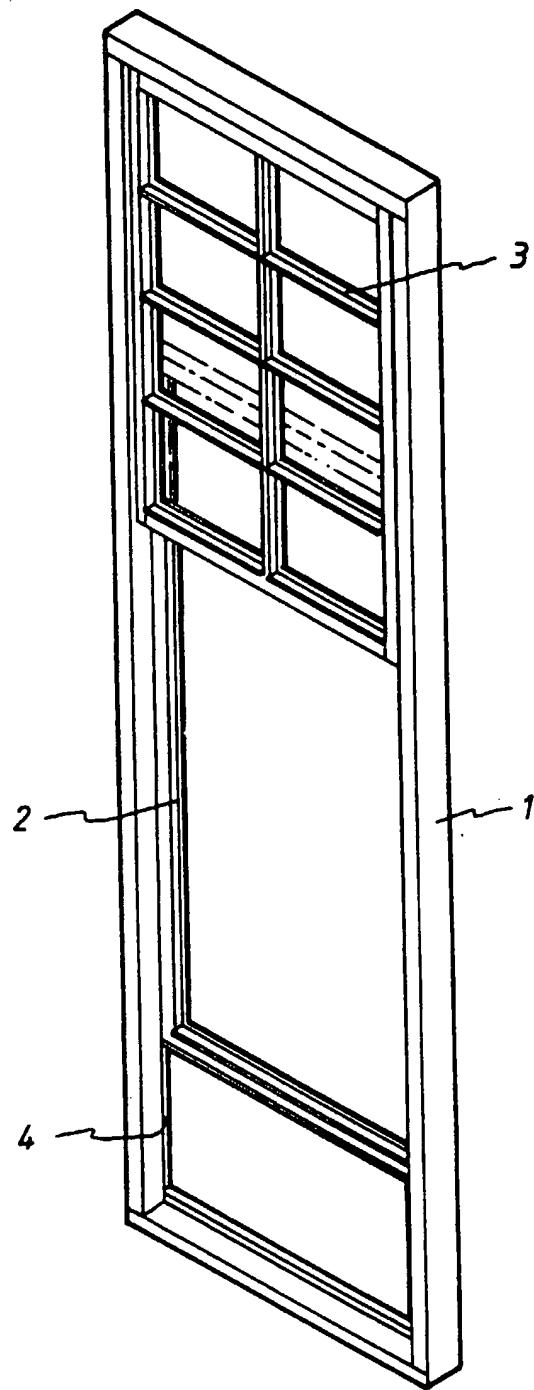
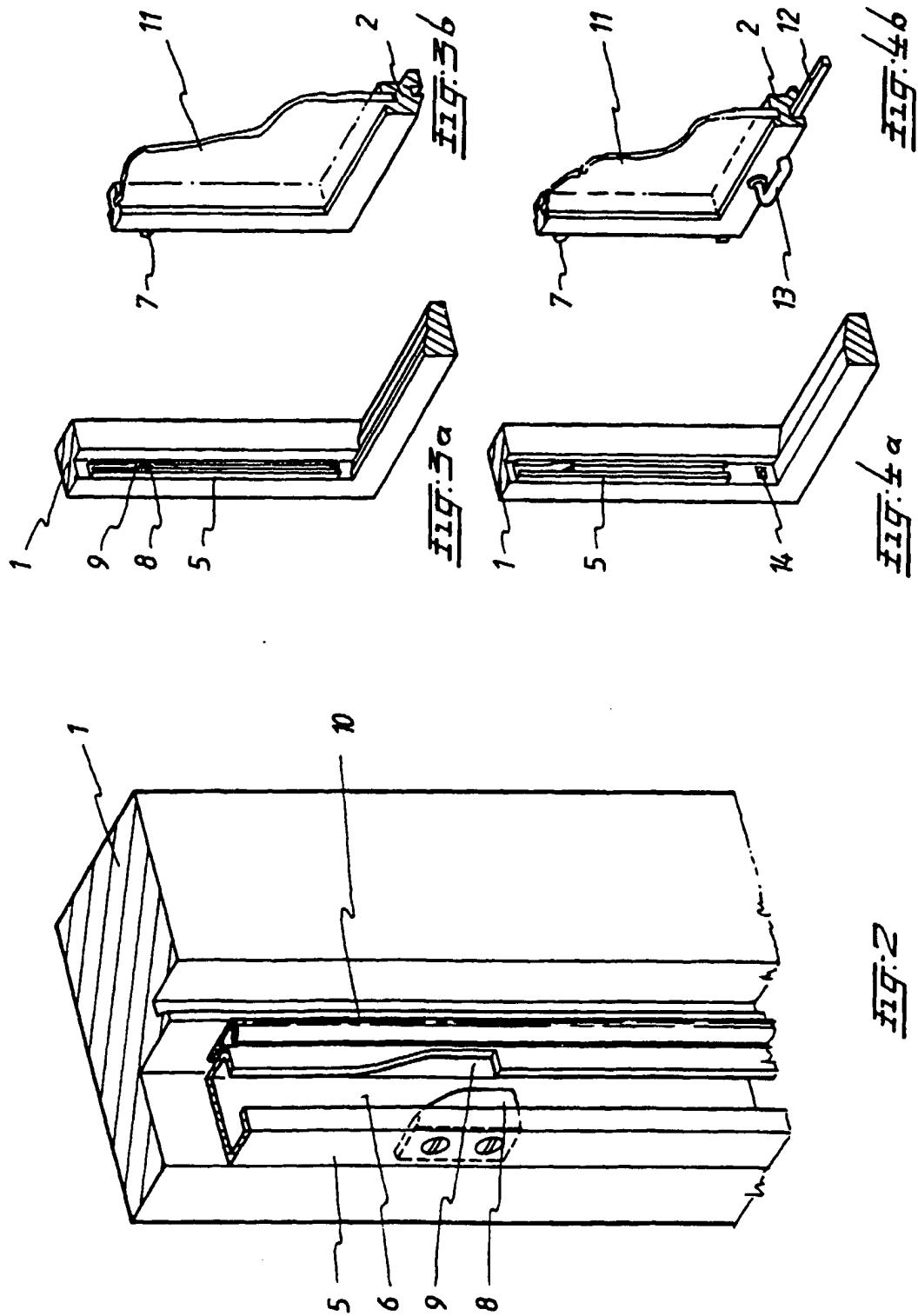
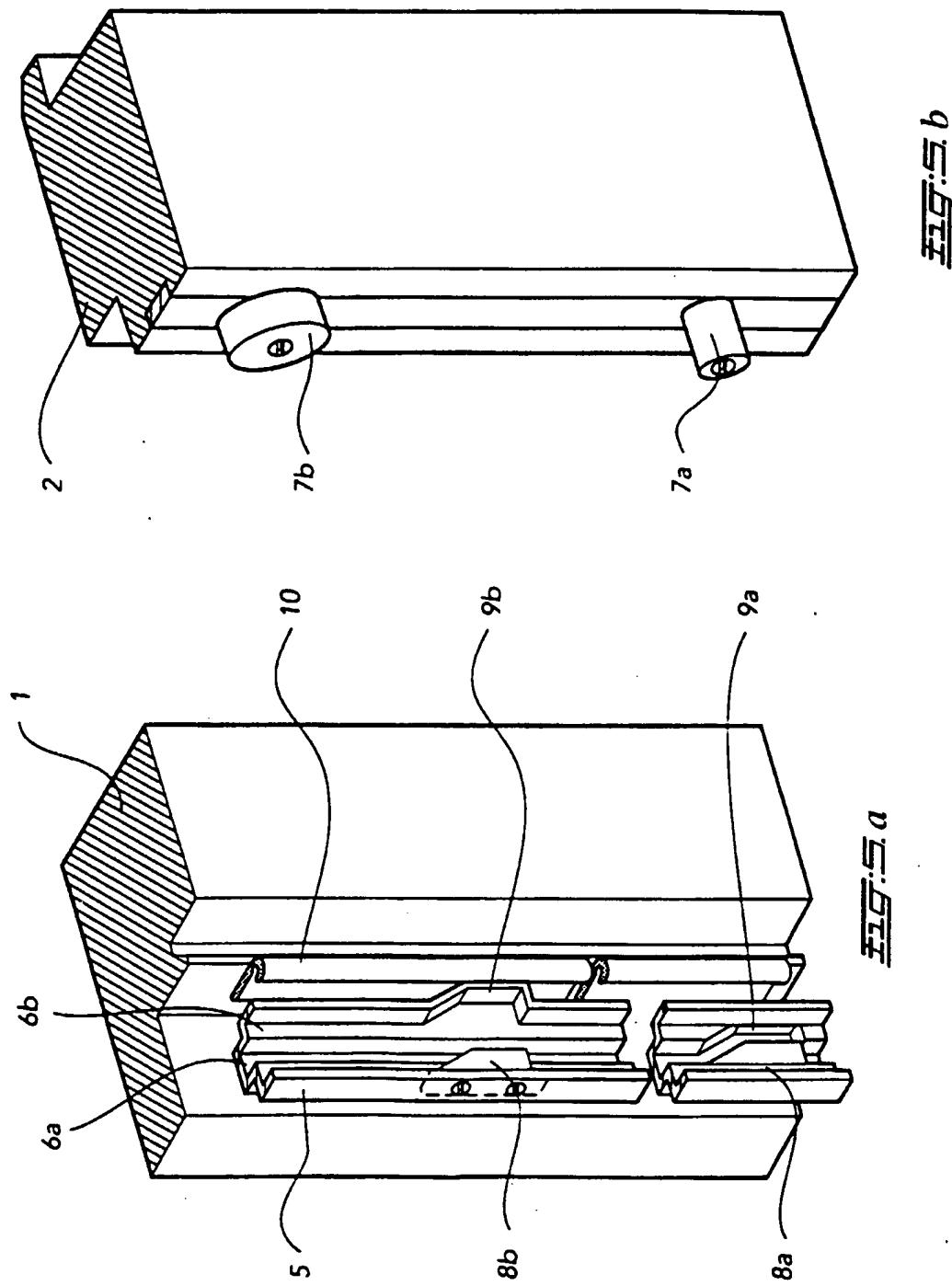


FIG:1





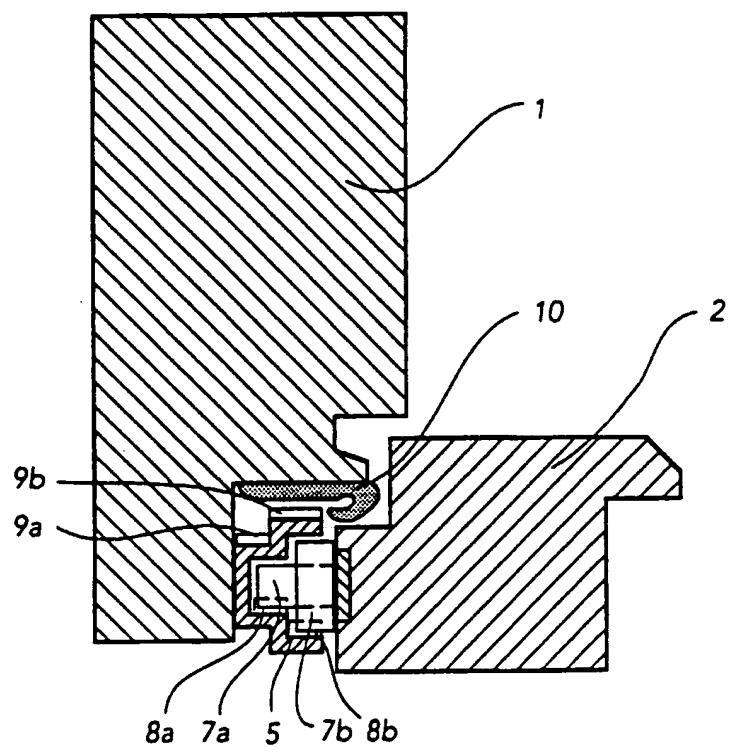
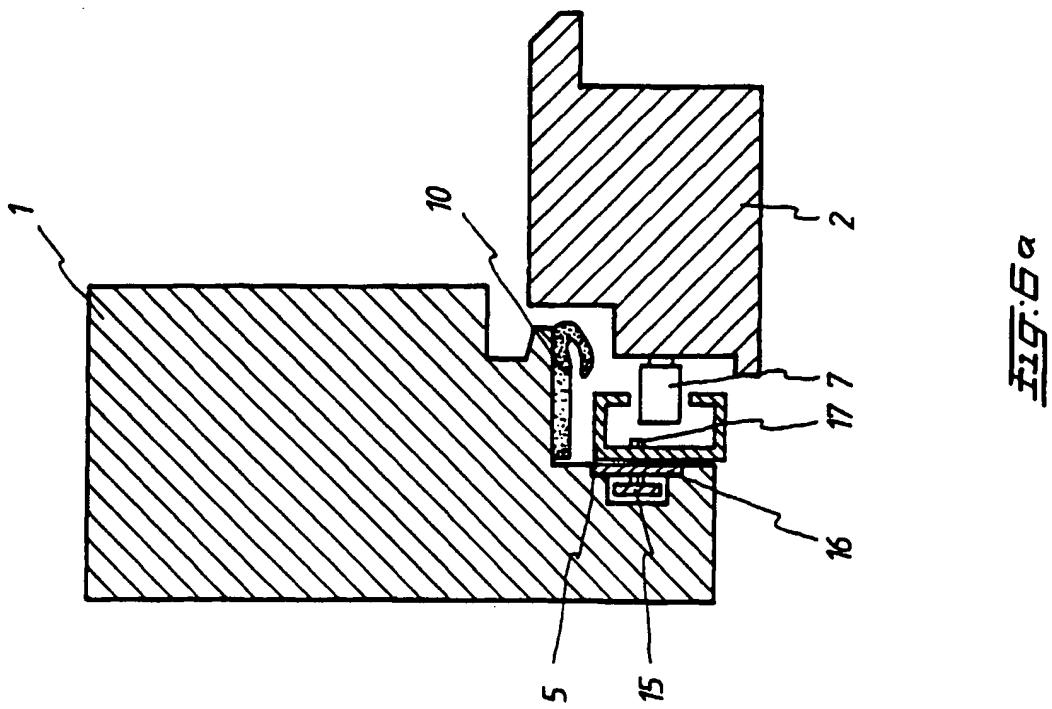
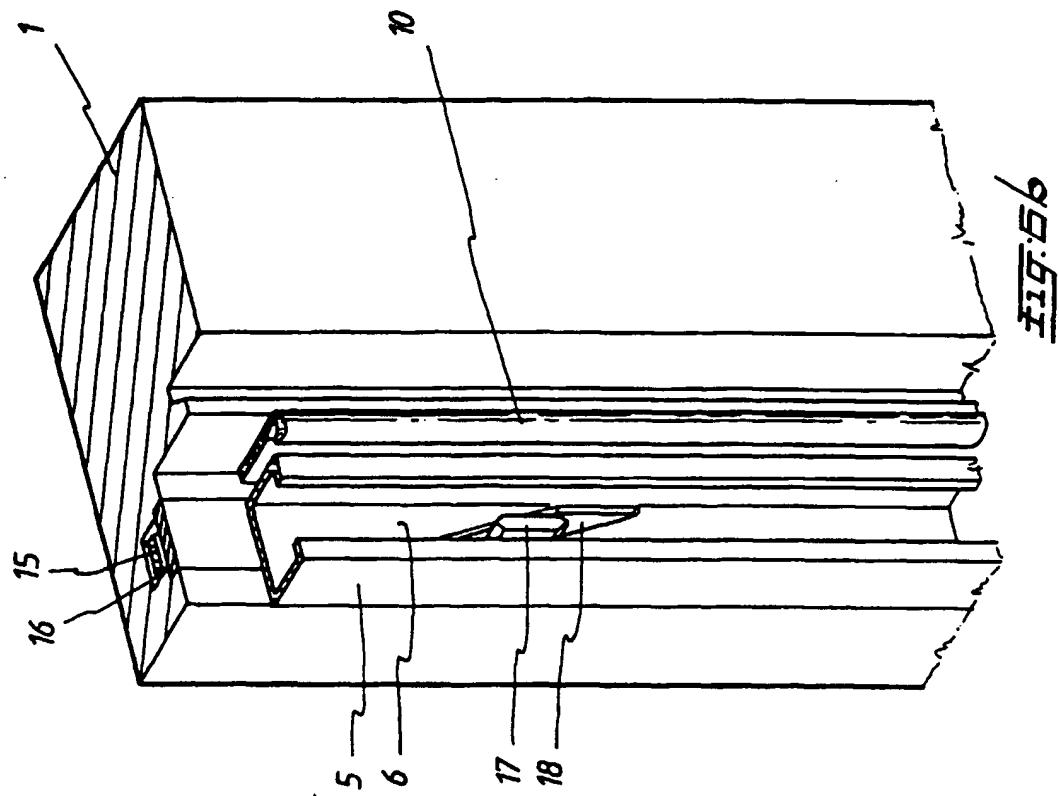
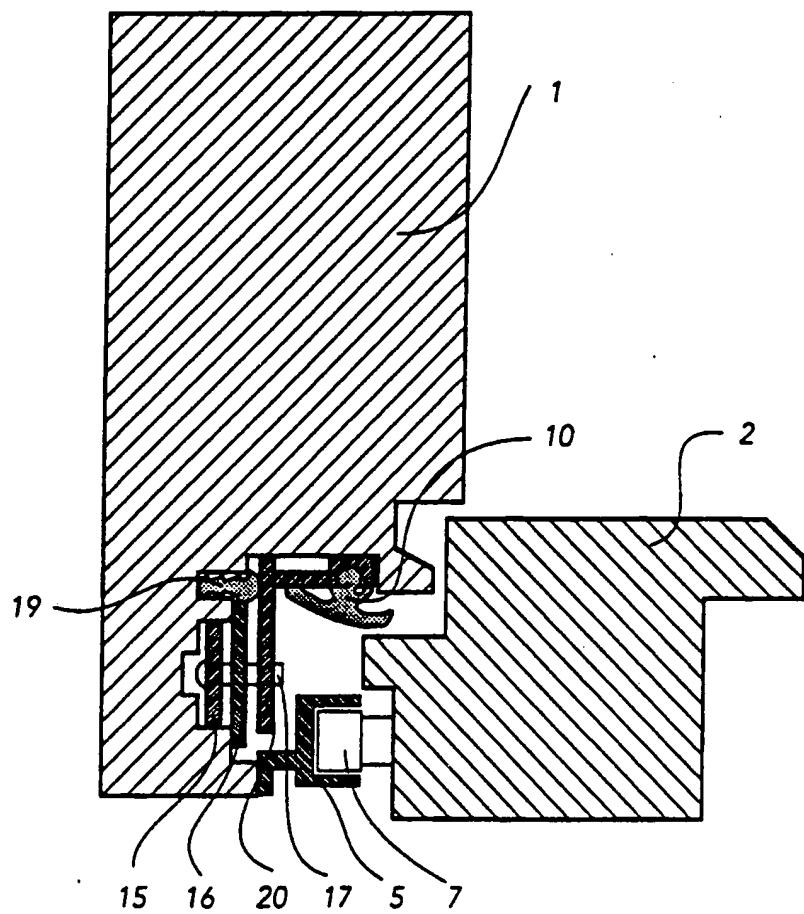
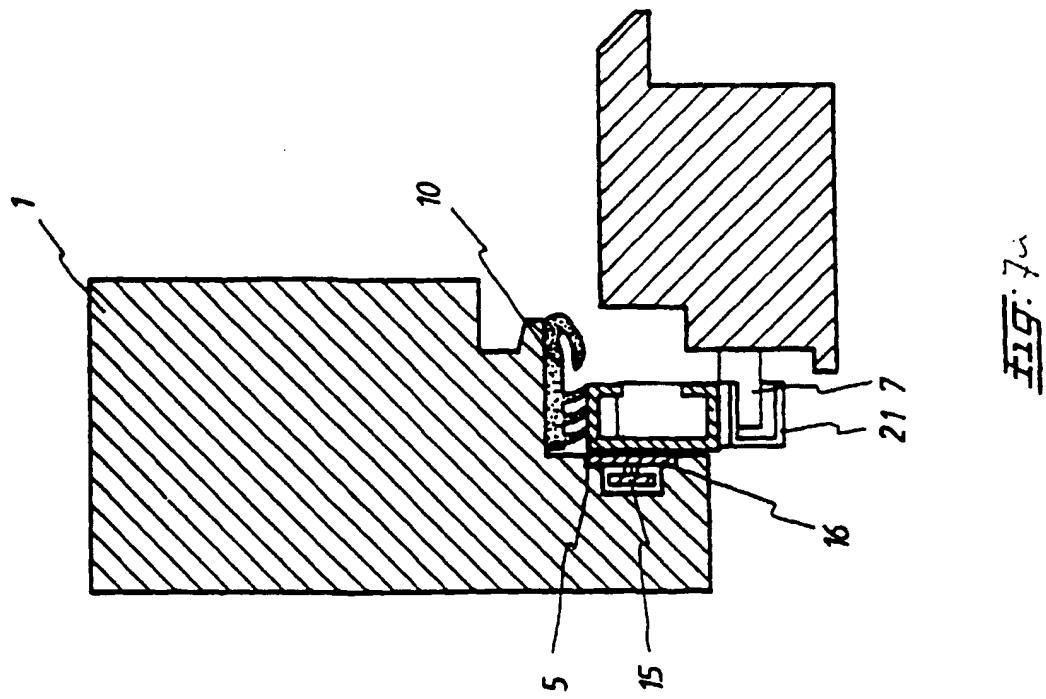
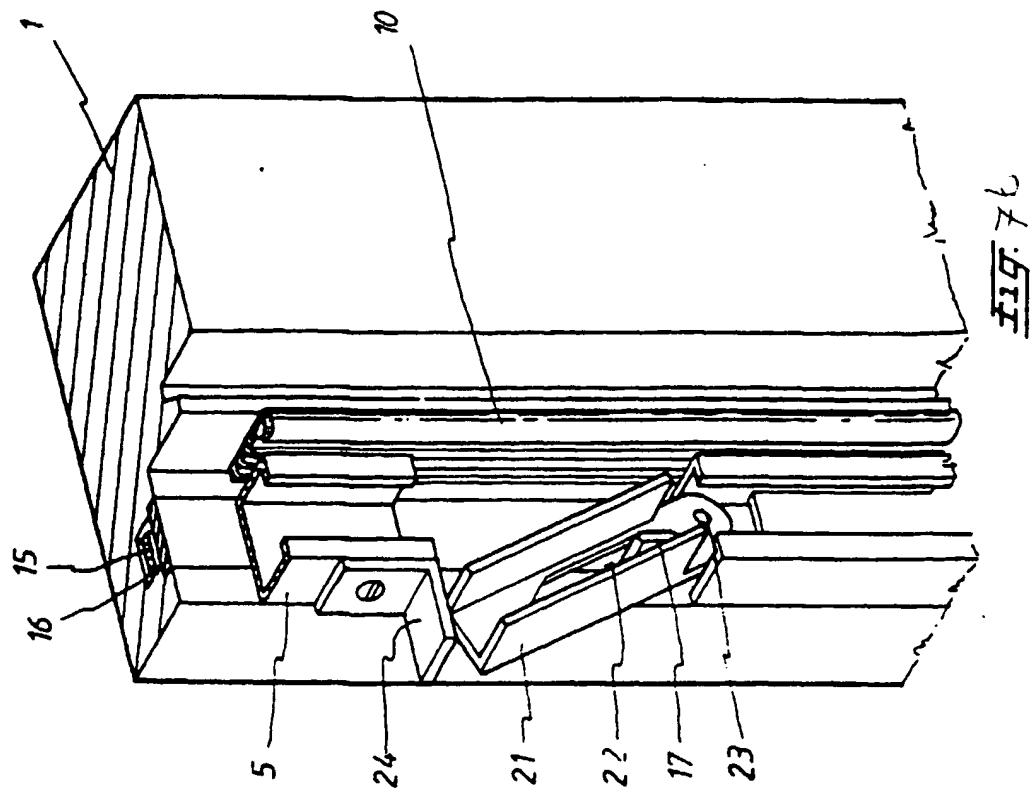


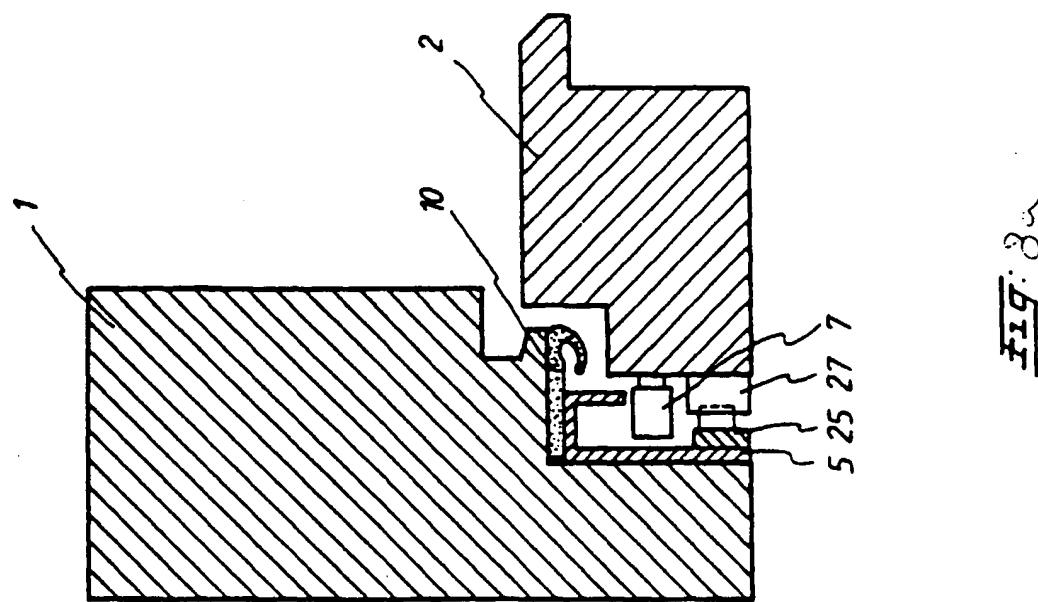
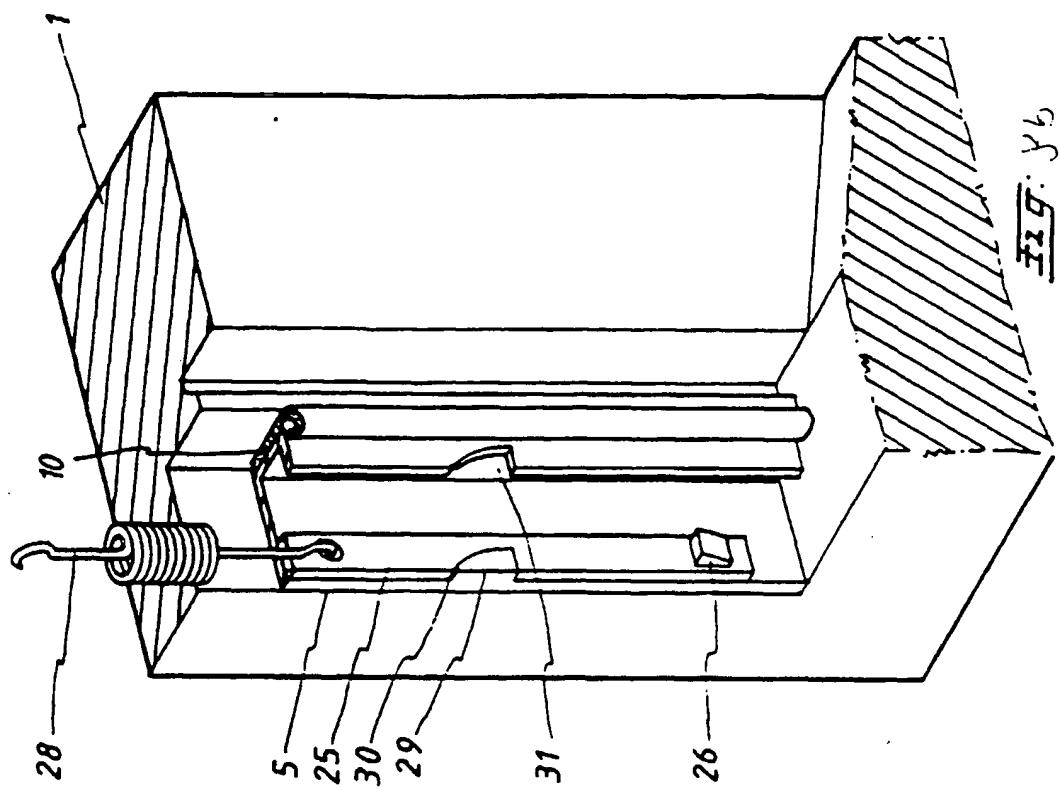
FIG. 11. C





EEG:7





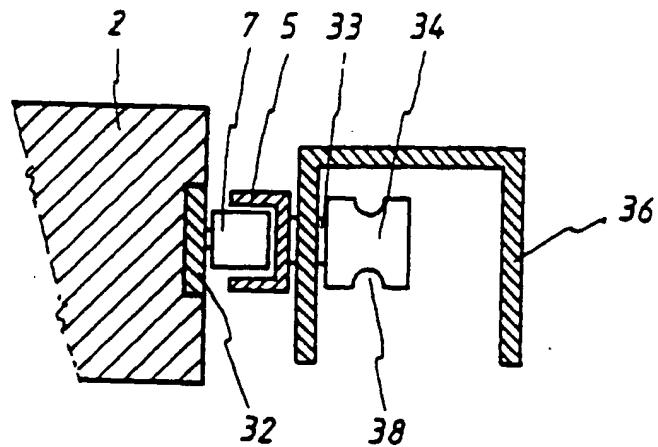


Fig. 9a

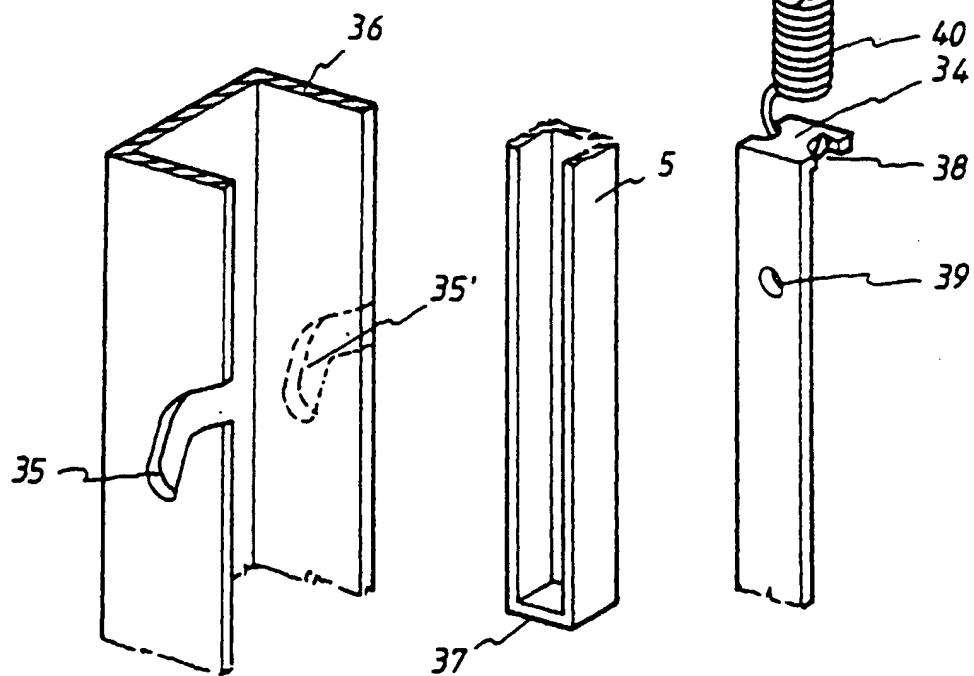
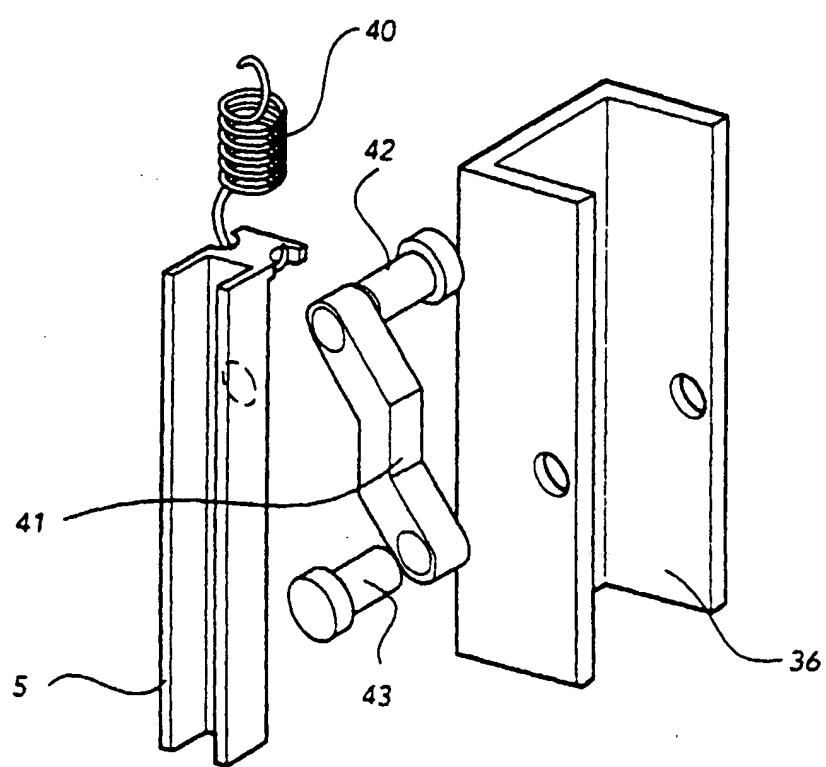


Fig. 9b

Fig. 9c

Fig. 9d



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